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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/689,980	10/20/2003	Joseph Smart	2867-206	3802
27820	7590	01/26/2005	EXAMINER	
WITHROW & TERRANOVA, P.L.L.C.			TRAN, LONG K	
P.O. BOX 1287			ART UNIT	PAPER NUMBER
CARY, NC 27512			2818	

DATE MAILED: 01/26/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/689,980

Applicant(s)

SMART ET AL.

Examiner

Long K. Tran

Art Unit

2818

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 December 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 14 - 29 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 14 - 29 is/are rejected.
- 7) ☒ Claim(s) 25 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>7/7/04</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of **Group II, claims 14 - 29** in the reply filed on December 16, 2004 is acknowledged.
2. Claims **1 – 13** have been cancelled.

Information Disclosure Statement

3. This office acknowledges of the following items from the Applicant:
Information Disclosure Statement (IDS) filed on July 07, 2004.
The references cited on the PTO -1449 form have been considered.

Claim Objections

4. Claim 25 is objected to because of the following informalities: line 2, delete "a" in front of "source". Appropriate correction is required.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
6. Claim **26** recite the limitations " the first, second, and third regions" in lines 1 & 2.
There is insufficient antecedent basis for this limitation in the claim.

Claim **27** recite the limitations " the first and third regions" in lines 1 & 2. There is insufficient antecedent basis for this limitation in the claim.

Claim **29** recite the limitations " the first and second regions" in lines 1 & 2.

There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims **14 – 25** and **28** are rejected under 35 U.S.C. 103(a) as being unpatentable over Gaska et al. (US Patent Application Publication No. 2004/0070003) in view of Ngo et al. (US Patent No. 6,706,576).

Regarding claims **14** and **15**, Gaska et al. show a method of growing a gallium nitride epitaxial structure comprising:

Depositing a structural epitaxial 14/16 (fig. 2) including a GaN buffer layer [0029], [0030], [0031] and [0032];

Depositing a silicon nitride passivation layer on the GaN structural epitaxial layers before the GaN epitaxial structure is removed from associated growth chamber (note: Gaska et al. do not explicitly show a step of removing the GaN epitaxial structure. However, it would have been obvious and known to one of ordinary skill in the art at the time the invention was made to remove the structure (as shown in figure 2) out of the associated chamber and process to the next operation for patterning, etching, developing... in order to form structure as shown in figs. 4, 8 and 9).

Gaska et al. do not explicitly use a thermally assisted silicon nitride (a silicon nitride containing hydrocarbon gas at high temperature having more dense than traditional passivation layer deposited by PECVP as cited in the present claim) as a passivation layer.

However, Ngo et al. show a topside passivation layer 170 (fig. 2) is treated by laser thermal annealing to increase its density (column 4, lines 50 – 62).

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to provide the passivation layer of Gaska et al. with the treated by laser thermal annealing passivation layer of Ngo et al., in order to provide resistance to moisturizing chemical attack (column 4, lines 60 – 62).

Regarding claim **16**, Ngo et al. show the passivation layer step is a laser thermal annealing process.

Regarding claims **17** and **18**, Gaska et al. disclose the depositing of structural epitaxial layers step comprising depositing a transitional layer 20 (fig. 3) on the substrate and a GaN buffer layer 22 (fig. 3) on the transitional layer (fig. 3; [0032]).

Regarding claim **19**, Gaska et al. show depositing an AlGaN Schottky layer 14 (fig. 3) on the GaN buffer layer ([0029] and [0032]).

Regarding claim **20**, Gaska et al. show depositing a GaN layer 16 (fig. 3; [0029]) on the AlGaN Schottky layer 14 (fig. 3)

Regarding claims **21** and **22**, Gaska et al. show the claimed invention of claims 14 and 17 except for step of depositing an AlN sub-buffer layer on the transitional layer as cited in claim 21 and depositing the GaN buffer layer on the sub-buffer layer.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to duplicate buffer layer 22 (note: layer can be any combination of AlN, GaN) with a sub-buffer layer made of AlN, since it has been held that mere duplication of the essential working parts of a device involves only routine skill in the art

Regarding claim **23**, Gaska et al. show depositing an AlGaIn layer 14 (fig. 3) on the GaN layer 22.

Regarding claim **24**, Gaska et al. show depositing a GaN layer 16 (fig. 3; [0029]) on the AlGaIn Schottky layer 14 (fig. 3)

Regarding claim **25**, Gaska et al. show: source, gate, and drain regions of the passive layer (fig. 8) being etched for forming source contact 32 (fig. 8), gate 36A, and drain 34 (figs. 9 & 10), thereby forming a high electron mobility transistor (note: Gaska et al. do not explicitly show a step of etching the passivation layer 16 and forming source, gate and drain contacts. However, it would have been obvious and known to one of ordinary skill in the art at the time the invention was made to forming and etching (as shown in figures 7 and 8) in order to form device as shown in fig. 8).

Regarding claim **28**, Gaska et al. show: source and drain regions of the passive layer being etched for forming source contact 32B (fig. 9), gate 36B, and drain 34B (fig. 9), thereby forming a metal-insulator-semiconductor field effect transistor. (note: Gaska et al. do not explicitly show a step of etching the passivation layer 16 and forming source, drain contacts and gate contact. However, it would have been obvious and known to one of ordinary skill in the art at the time the invention was made to forming and etching (as shown in figures 7 and 9) in order to form device as shown in fig. 9).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Long K. Tran whose telephone number is 571-272-1797. The examiner can normally be reached on Mon-Thu.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Nelms can be reached on 571-272-1787. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Long Tran



January 21, 2005



David Nelms
Supervisory Patent Examiner
Technology Center 2800